

CAMPBELL

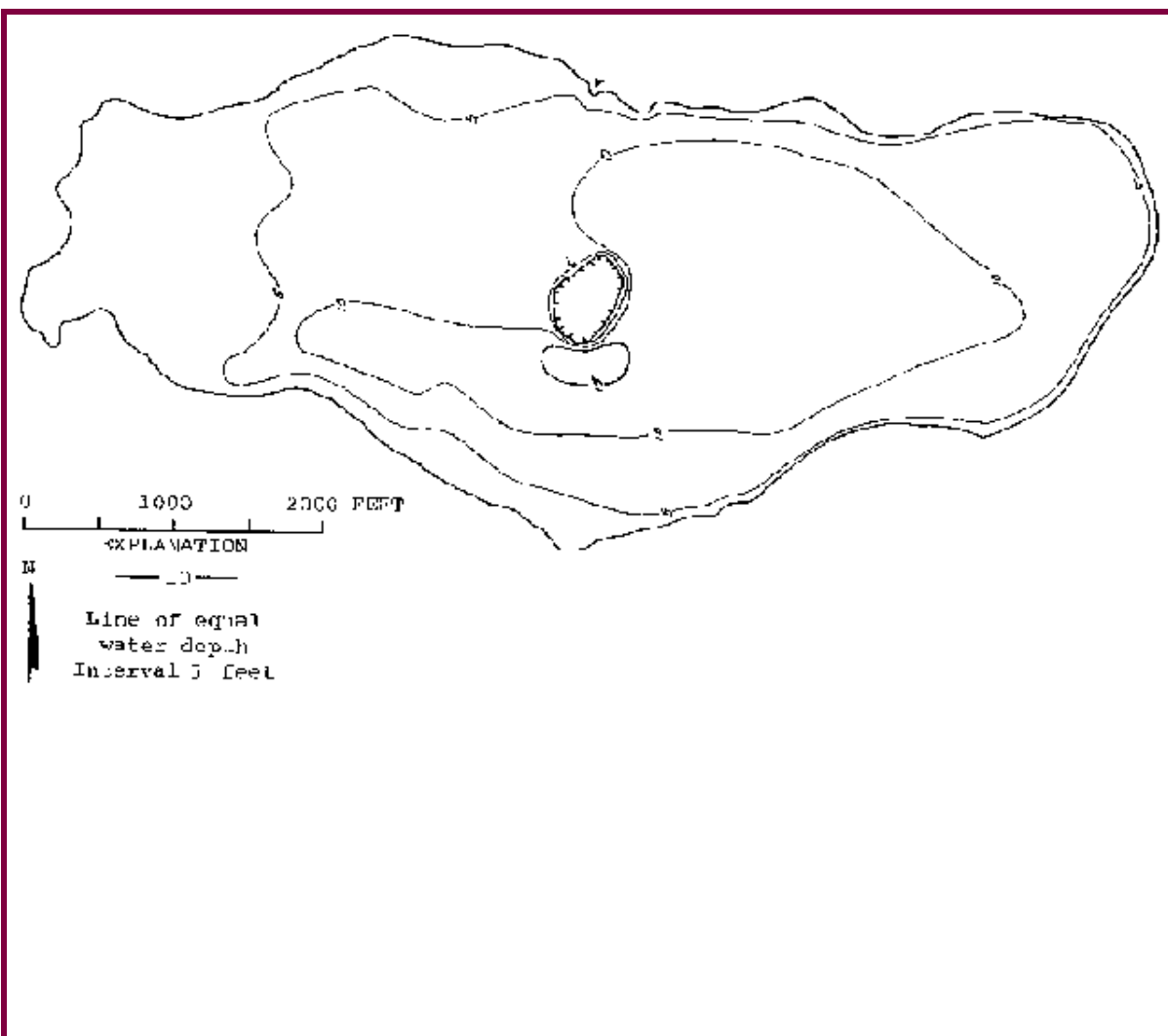
SKAGIT County

Lake ID: CAMSK1

Ecoregion: 2

Campbell Lake is located four miles south from Anacortes, and approximately fifteen miles west from Mount Vernon. It is 1.5 miles long. It is fed by Lake Erie via a small stream and drains to Simlik Bay. Its macrophytes are mechanically harvested and it serves as a popular sport fishing lake.

<i>Area (acres)</i>	<i>Maximum Depth (ft)</i>	<i>Mean Depth (ft)</i>	<i>Drainage (sq mi)</i>	
367	16	8	6	
<i>Volume (ac-ft)</i>	<i>Shoreline (miles)</i>	<i>Altitude (ft abv msl)</i>	<i>Latitude</i>	<i>Longitude</i>
2770	3.69	43	48 26 05.	122 36 53.



Station Information

CAMSK1

Primary Station

Station # 1

latitude: 48 26 15.0

longitude: 122 37 00.0

Description: About 50 meters off of the south side of the Island

Trophic State Assessment for 1999

CAMPBELL

Analyst: Sarah O'Neal

TSI_Secchi:	^a	53
TSI_Phos:		52
TSI_Chlor:		68
Narrative TSI:	^b	E

Campbell Lake is probably naturally eutrophic. The lake is shallow, and had abundant plant and algal growth. High productivity prompted a restoration project for the lake in 1986, which included alum treatment. WDFW and Entranco Engineering documented a subsequent improvement in trophic state. However, two of three survey respondents indicated a decline in water quality (the remaining respondent did not know about water quality trends). This may have been due to both frequent--and occasionally foul smelling--algal blooms, as well as the introduction and proliferation of the invasive, non-native aquatic plant, Eurasian watermilfoil. The milfoil dominated the plant community in the lake and formed surface mats by mid-summer. The lake exhibited exceptionally high chlorophyll-a levels, which peaked in June with a concentration of 113 ug/L. This indicates an extraordinary level of photosynthetic activity. The lake shoreline was mainly vegetated, though it was significantly influenced by residential development. Residences dominated the watershed, but agriculture was also prominent, and cows were seen in the lake. How these potential sources of nutrients affected trophic state is unknown. Fortunately, fecal coliform levels remained insignificant throughout the summer, at least at designated sample sites.

Uses supported by the lake included swimming, fishing, and relaxing. Motorized activities included water-skiing and jetskiing, and questionnaire respondents consistently indicated a desire to restrict watercraft in order to reduce noise levels. A large littoral zone provided extensive warmwater fish habitat. The healthy zooplankton community decreased drastically in average size by August, indicating predation by planktivores and possible scarcity of piscivorous species. According to a WDFW survey, also conducted in 1999, largemouth bass and bluegill were the most abundant fish in the lake, followed closely by yellow perch. Brown bullhead, pumpkinseed, black crappie, and sculpin were also present at lower densities in Campbell Lake. No coldwater fish were found, however, likely due to warm temperatures and low oxygen levels at deeper depths.

Despite some indicators of poor water quality, uses of the lake appeared to be supported, including fishing, primary contact recreation, and relaxing. Because uses were supported, and the lake is probably naturally eutrophic, a total phosphorus criterion may be set at the seasonal mean that was established during 1999

sampling, adjusted for interannual variability. Therefore, pending a more thorough study, including a nutrient budget analysis, we recommend a tentative total phosphorus criterion for the lake of 32.6 ug/L (mean 27.8 ug/L plus standard deviation of 4.8 ug/L).

Mean Secchi = 1.6m; Mean TP = 27.8 ug/L; Mean Chl = 44.0 ug/L

^a TSI Qualifiers: B or W-Secchi Disk hit bottom or entered weeds; J-Estimate; N-Fewer than the required number of samples

^b E=eutrophic, ME=mesoeutrophic, M=mesotrophic, OM=oligomesotrophic, O=oligotrophic

Chemistry Data

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Date	Time	Strata	Tot P (ug/L)	Tot N (mg/L)	TN:TP	Chloro- phyll (ug/L)	Fecal Col. Bacteria (#/100mL)	Hardness (mg/L)	Calcium (ug/L)	Turbidity (NTU)
Station 0										
6/8/1999		L					1 U			
		L					1 U			
7/14/1999		L					1			
		L					1			
8/10/1999		L					10			
		L					10			
Station 1										
6/8/1999		E	78.3	1.44	18	113		79	17200	8.3
7/14/1999		E	35.1	1.79	51	23.6				2.4
8/10/1999		E	17.4	.98	56	15.4				1.5
9/17/1999		E	29.1	.885	30	15.7				

Strata: L=lake surface, E=epilimnion, H=hypolimnion; Qualifier: J=Estimate, U=Less than, G=Greater than.

Watershed Survey

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Survey Date: 9/17/1999

Land Uses (1 = Primary, 2 = Secondary, etc.)

☐ 2 Agriculture (commercial, not hobby)

☐ 1 Residential

☐ 4 Commercial, Industrial

☐ Park, forest or natural

☐ 3 Major transportation

Impervious surfaces (Roads and parking area): No Curbs

Observations (check mark denotes presence)

BMP's ☐

Cattle in the water just west of the boat launch

Odors ☐

None

Cattle ☒ Ducks ☐ Geese ☐

Cattle seen in the water just west of the boat launch by Fish & Wildlife fisheries biologists.

Fertilizers and weed killers appear to be used in residential or agriculture area ☐

Buffer zones around streams and wetlands ☒

Irrigation ☐

Survey Id: 50

Habitat Survey Summary Report

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Data are averages of 10 Stations Surveyed

Date of Visit: 8/4/1999

Vegetation Type (Avg. only of sites w/ vegetation present; 1=coniferous, 3=deciduous)

Canopy Layer Avg:	2.6	Number of stations with canopy:	9
Understory Avg:	2.8	Number of stations with understory:	10

Percent Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

Canopy Layer:	trees > 0.3 m DBH	1.3
	trees < 0.3 m DBH	1.9
Understory:	woody shrubs _saplings	2.0
	tall herbs, forbs _grasses	1.1
Ground Cover:	woody shrubs _seedlings	1.4
	herbs, forbs, grasses	2.4
	standing water or inundated veg	1.1
	barren or buildings	0.6
Substrate Type (within shoreline plot):	bedrock	0.2
	boulders	0.0
	cobble/gravel	0.0
	loose sand	0.0
	other fine soil/sediment	0.0
	vegetated	3.6
	other	0.6
Bank Features:	angle (0:<30; 1: 30-75; 2:nr vertical)	1.1
	vertical dist (M from wtrln to high wt):	0.0
	horiz. dist. (M from wtrln to high wt):	0.0

Human Influence (0 = absent, 1 = adjacent to or behind plot, 2 = present within plot)

buildings	0.6
commercial	0.2
park facilities	0.2
docks/boats	0.9
walls, dikes, or revetments	0.6
litter, trash dump, or landfill	0.2
roads or railroad	0.4
row crops	0.0
pasture or hayfield	0.1
orchard	0.0
lawn	0.6
other	0.2

Physical Habitat Characteristics

station depth (m; at 10 m from shore)	1.5
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Bottom Substrate (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

bedrock	0.0
boulders	0.0
cobble	0.0
gravel	0.1
sand	0.3
silt	3.7
woody debris	0.4

Macrophyte Areal Coverage (0 = absent, 1 = <10%, 2 = 10-40%, 3 = 40-75%, 4 = >75%)

submergent	2.2
emergent	1.3
floating	1.6
total weed cover	3.3

Do macrophytes extend lakeward (-1 = yes, 0 = no)	-1.0
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Fish Cover (0 = absent, 1 = Present but sparse, 2 = moderate to heavy)

aquatic weeds	2.0
snags	0.0
brush or woody debris	0.6
inundated live trees	0.0
overhanging vegetation	0.7
rock ledges or sharp dropoffs	0.3
boulders	0.0
human structures	0.4

Questionnaire

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Results compiled from 3 Surveys.

Average time (years) respondents spent on lake: 41.00

Did the following add (+1), detract (-1), or have no effect (0) on your enjoyment of the lake today?

Types of WaterCraft:	-0.3	View:	0.7	Distance to Lake:	0.0
Public Access:	-0.3	Swim Beach:	-0.3	Canada Geese:	0.0
Water Clarity:	-0.3	Water Qual. for Swim:	0.0		
Fishing Quality:	0.0	Aquatic Plants:	0.7		

On a scale of 1 (poor) to 5 (excellent), how would you rate water quality today? 2.3

Which would you rather have, 1 or 2?

- | | |
|---|-----|
| 1) Better fishing and more natural habitat, or 2) clearer water? | 1.0 |
| 1) Better fishing and more natural habitat, or 2) fewer aquatic plants? | 1.3 |
| 1) Clearer water, or 2) fewer aquatic plants? | 1.3 |

How important is each of the following characteristics to you (1 = very undesirable, 5= very desirable):

Restricted Watercraft:	5.0	Good Warmwtr Fishing:	4.7	Natural Scenery:	4.7
Plant Growth:	4.0	Good Swimming:	3.0	Public Beach:	2.3
Natural Shoreline:	4.7	Less Algae:	4.0	Canada Geese:	3.3
No Odors:	4.0	Public Access:	2.7		
Good Coldwtr Fishing:	2.7	Clear Water:	3.3		

Tabulated Results

Survey ID	Date	-----Residency-----	Rent or Own	Primary Activity*	-----Water Clarity----- Purchase Factor?	Has it Changed?	When?
103	9/18/1999	Resident	Seasonal	Rent	10	<input type="checkbox"/>	Worse
Would desire less noise on the lake. The highway is loud enough.							
129	8/10/1999	Visitor			2	<input type="checkbox"/>	Unknown
138	6/14/1999	Resident	Permanent	Rent	1	<input checked="" type="checkbox"/>	Worse 1993
Restrict noise							

* 1=canoe/kayak, 2=fish, 3=pers. wtrcraft, 4=mtrboat, 5=sail, 6=swim/wade, 7=watch wldlf, 8=ski, 9=windsurf, 10=relaxing

Zooplankton Report

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Date 6/8/1999 Station: 1 About 0.3 mL measured. Dense algae, some rotifers.
Sample ID 67

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	1.15

Date 8/10/1999 Station: 1 About 1/3 mL. measured--sample was very dense with both plankton and algae.
Sample ID 35 Very difficult to distinguish smaller zooplankton, and some may have been missed.
Site number and length of tow were not labelled.

Number of organisms measured: #Delet

Group	Percent	Group	Percent
Cladocera	#Deleted	Small < 1mm	#Deleted
Copepod	#Deleted	Large >= 1mm	#Deleted
Other	#Deleted	Ratio of large to Smal	#Num!
		Average size (mm):	0.56

Aquatic Plant Data

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Sampler: Parsons, O'Neal

Survey Date: 8/4/1999

Max depth of growth (M): 3

Comments Fog, breeze. Lots of filamentous algae on the plants, submersed plants not reaching the surface. Could boat clear to the west end. Water may be higher than usual. Fog made visibility poor. Did habitat survey

SPECIES LIST

Scientific Name	Common Name	Dist ^a	Comments
<i>Ceratophyllum demersum</i>	Coontail; hornwort	3	
<i>Iris pseudacorus</i>	yellow flag	3	
<i>Juncus sp.</i>	rush	2	
<i>Lemna trisulca</i>	star duckweed	2	
<i>Myriophyllum spicatum</i>	Eurasian water-milfoil	4	not at surface, harvester has been working
<i>Nuphar polysepala</i>	spatter-dock, yellow water-lily	3	around much of lake
<i>Nymphaea odorata</i>	fragrant waterlily	2	most dense toward developed areas on east half
<i>Potamogeton pectinatus</i>	sago pondweed	2	
<i>Potamogeton sp (thin leaved)</i>	thin leaved pondweed	2	
<i>Scirpus sp.</i>	bulrush	2	
<i>Typha latifolia</i>	common cat-tail	2	

^a 0 - value not recorded (plant may not be submersed)

2 - few plants, but with a wide patchy distribution

4 - plants in nearly monospecific patches, dominant

1 - few plants in only 1 or a few locations

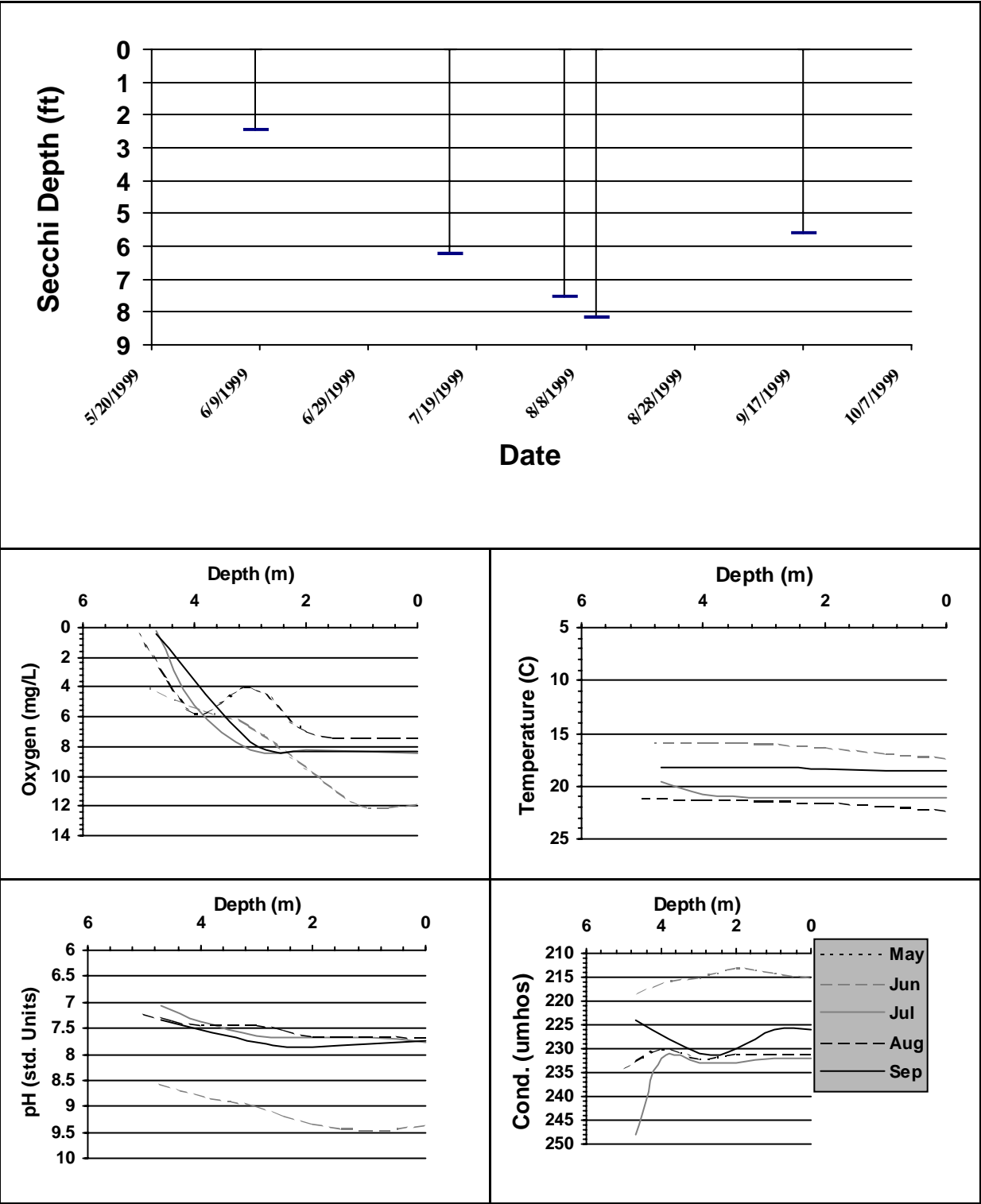
3 - plants in large patches, codominant with other plants

5 - thick growth covering substrate to exclusion of other species

Secchi Depth and Profile Graphics

Station: 1

CAMSK1



Secchi Data and Field Observations

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Date	Time	Temp- erature (F)	Secchi (ft)	Color (1-greens, 11-browns)	Bright- ness (pct)	Wind (1-none, 5-gusty)	Rainfall (0-none, 5-heavy)	Aesthetics (1-bad, 5- good)	Swimming (1-poor, 5- good)	Geese (#)	Waterfowl (besides geese #)	Boats- Fishing (#)	Boats- Skiing (#)
Station 1													
6/8/1999			2.46	3	0	2	1	4	1	0	1	2	0
	Sampler: SMITH			Remarks: Eagle observed perching on Island. Very little algae at 4 meters. Oxygen plentiful down to bottom. A brilliant blue algae. Looks like Microcystis--small spherical cells with no sheath. Lake heavily used by jet skis and water skiers.									
7/14/1999			6.23		100	1	1	5	4	0	0	2	0
	Sampler: SMITH			Remarks: Many many zooplankton									
8/4/1999			7.55										
	Sampler: Parsons			Remarks:									
8/10/1999			8.2	6	10	1	1	5	4	0	0	3	1
	Sampler: SMITH			Remarks: A slight blue-green bloom.									
9/17/1999			5.6	3	10	1	1	5	2	0	0	1	0
	Sampler: SMITH			Remarks: Significant algal bloom									